

Binomial Expansion

■ **Concept:** Expanding powers of binomials using Pascal's triangle

Remember: In the expansion of a binomial $(a + b)^n$

1. The first term is a^n
2. For each successive term: the exponent of a decreases by 1; the exponent of b increases by 1; the coefficient of each term corresponds to the n th row of Pascal's triangle.
3. The last term is b^n .

Example: Expand $(2x - y)^5$.

Expand $(a + b)^n$, letting $a = 2x$, $b = -y$, $n = 5$.

The coefficients of the fifth row of Pascal's triangle are:

$$\begin{array}{ccccccc}
 & & 1 & & 5 & & 10 & & 10 & & 5 & & 1 \\
 (2x - y)^5 & = & (2x)^5 & + & 5(2x)^4(-y) & + & 10(2x)^3(-y)^2 & + & 10(2x)^2(-y)^3 & + & 5(2x)(-y)^4 & + & (-y)^5 \\
 & = & 32x^5 & - & 80x^4y & + & 80x^3y^2 & - & 40x^2y^3 & + & 10xy^4 & - & y^5
 \end{array}$$

Expand each binomial.

1. $(x + 2)^3$ _____
2. $(x - 1)^8$ _____
3. $(x - 2y)^4$ _____

Complete each of the following statements.

In the expansion of $(a + b)^n$:

4. The number of terms is _____.
5. For each term, the sum of the exponents of a and b is _____.
6. The exponents of a begin with _____ and decrease by _____ for each succeeding term.
7. The exponents of b begin with _____ and increase by _____ for each succeeding term.
8. The coefficients of the terms form a pattern known as _____.